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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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T: 002 036

Development of USES Aptitude Test Battery

for

Polisher

(jewelry) 700.887

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

ED 068555

Technical Report on Development of USES Aptitude Test Battery

For . . . .

Polisher (jewelry) 700.887

S-424

(Developed in Cooperation with the Rhode Island State Employment Service)

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October 1968

FORWARD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different operations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Charles E. Odell, Director
U. S. Employment Service

GATB Study #2710

DEVELOPMENT OF USES APTITUDE TEST BATTERY

FOR

Polisher (jewelry) 700.887-034

S-424

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Polisher (jewelry) 700.887-034. Mr. George R. Frankovich, Executive Director of the Jewelers Manufacturers and Silversmiths of America, Inc. was instrumental in obtaining employer cooperation for this study. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S- Spatial Ability	75
P- Form Perception	65
Q- Clerical Perception	80

RESEARCH SUMMARY

Sample:

57 male workers employed as Polishers throughout the city of Providence, Rhode Island.

Criterion:

Supervisory ratings

Design:

Concurrent (test and criterion were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .26 (P/2 .025)

Effectiveness of Norms:

Only 75% of the non-test selected workers used for this study were good workers; if the workers had been test-selected with the S-424 norms, 83% would have been good workers. 25% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 17% would have been poor workers. The effectiveness of norms is shown graphically in Table 1.

Effectiveness of Norms

TABLE 1

	Without Tests	With Tests
Good Workers	75%	83%
Poor Workers	25%	17%

SAMPLE DESCRIPTION

Size:
N=57

Occupational Status:
Employed Workers

Work Setting:
Workers were employed by the following companies:

Beaucraft, Inc.
Providence, Rhode Island

Dolan and Bullock
Providence, Rhode Island

Levin Plating, Inc.
Pawtucket, Rhode Island

Vargas Manufacturing Company
Providence, Rhode Island

Kinney Company
Providence, Rhode Island

Lang Jewelry Company
Providence, Rhode Island

Trifari Krussman and Fishel
East Providence, Rhode Island

Employer Selection Requirements:

Education: No requirement

Previous Experience: Minimum of three months experience. No experience required for entry work as trainees.

Tests: None

Other: Personal Interview

Principal Activities:

The job duties for each worker are comparable to those shown on the Fact Sheet.

Minimum Experience:

All workers had completed an on-the-job training period of 12 months.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

	Mean	SD	Range	r
Age (years)	44.9	10.3	20-63	.187
Education (years)	9.7	2.1	2-13	.081
Experience (Months)	227.3	120.3	6-480	.408**

* Significant at the .05 level

EXPERIMENTAL TEST BATTERY

All twelve tests of the GATB, were administered during the period January 1967 through March 1968.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency. Ratings and reratings for each worker were made at approximately the same time as the tests were administered, with a time interval of two weeks between the two ratings.

Rating Scale: The USES Descriptive Rating Scale, Form SP-21, was used. The scale (see appendix) consists of nine items with five alternatives for each item. The alternatives indicated the degrees of job proficiency.

Reliability: The coefficient of correlation between the two ratings was .93 indicating satisfactory criterion reliablity.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	35-88
Mean:	69.4
Standard Deviation:	10.8

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 25% of the sample in the low group to correspond with the percentage of workers considered to be unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers". The criterion critical score is 64.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitude S was considered for inclusion in the norms because the sample had a relatively high mean score on this aptitude and it was considered important for the job based on job analysis. With employed workers a high mean may indicate that some sample pre-selection has taken place. Tables 3, 4 and 5 show the results of the qualitative and statistical analysis.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
S - Spatial Ability	Necessary to be able to visualize finished jewelry product.
P - Form Perception	Necessary to distinguish the differences in the forms of various jewelry parts that are different in size, shape and contour.
K - Motor Coordination	Necessary to coordinate eyes and hands quickly when rotating objects on a polishing wheel in order to obtain the best finish or lustre.
F - Finger Dexterity	Necessary to manipulate small objects when turning and holding against the buffing compound or to feel rough edges or pit marks.
M - Manual Dexterity	Necessary to manipulate various sizes of jewelry pieces by placing and turning against rotating discs or wheels.

TABLE 4

Means, Standard Deviations (SD), Ranges, And Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB.

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	85.3	15.5	57-128	.149
V - Verbal Aptitude	87.9	12.9	63-121	-.027
N - Numerical Aptitude	84.8	14.0	61-115	.173
S - Spatial Aptitude	92.0	17.3	65-130	.240
P - Form Perception	92.8	18.3	49-130	.293*
Q - Clerical Perception	99.9	11.7	71-135	.420**
K - Motor Coordination	90.4	17.8	43-151	.170
F - Finger Dexterity	82.1	17.6	36-123	.025
M - Manual Dexterity	88.5	19.8	53-145	-.169

*Significant at the .05 level
**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important				X	X		X	X	X
Irrelevant		O	O						
Relatively High Mean				X	X	X			
Relatively Low Standard Dev.		X	X			X			
Significant Correlation with Criterion					X	X			
Aptitudes to be Considered for Trial Norms				S	P	Q			

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of comparison of the degree to which trial norms consisting of various combinations of aptitudes S, P and Q at trial cutting scores were able to differentiate between 75% of the sample considered good workers and the 25% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one third of the sample with three aptitude norms. For two aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about 1/3 of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of S-75, P-65 and Q-80 provided the optimum differentiation for the occupation of Polisher (jewelry) 700.887-034. The

validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient .26 (statistically significant at the .025 level).

TABLE 6

Concurrent Validity of Test Norms S-75, P-65 and Q-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	35	43
Poor Workers	7	7	14
Total	15	42	57

Phi Coefficient (ϕ) = .26 Chi Square (X^2_y) = 3.9
Significance Level P/2 .025

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 2/61

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only <u>one</u> box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

☐ See him at work all the time.

☐ See him at work several times a day.

☐ See him at work several times a week.

☐ Seldom see him in work situation.

How long have you worked with him?

☐ Under one month.

☐ One to two months.

☐ Three to five months.

☐ Six months or more.

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.

☐ 2. Capable of low work output. Can perform at a slow pace.

☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.

☐ 4. Capable of high work output. Can perform at a fast pace.

☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

☐ 1. Almost never is able to figure out what to do. Needs help on even minor problems.

☐ 2. Often has difficulty handling new situations. Needs help on all but simple problems.

☐ 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

☐ 4. Usually able to handle new situations. Needs help on only complex problems.

☐ 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

☐ 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

☐ 2. Slow to see new ways to improve methods. Contributes few practical suggestions.

☐ 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

☐ 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

☐ 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and <u>only</u> these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

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FACT SHEET

Job Title: Polisher (jewelry) 700.887-034

Job Summary:

Polishes, smooths and buffs jewelry, such as emblems, charms, earrings, pins, rings, jewelry findings, and bracelets, using polishing wheel.

Work Performed:

Selects polishing wheel and dressing compound according to type of metal to be polished and type of finish desired. Applies dressing compound or rouge to rotating wheel and moves article by holding with fingers of hand or on a jig against wheel to remove surface blemishes and produce luster. May also rotate or move article in position against wheel to polish edges or parts of article. May apply dressing compound and rub articles with cloth to remove discoloration and produce luster. May buff jewelry findings with abrasive to produce grain effect (dull granulated surface) and be designated grainer. When holding jewelry against lapping disk to smooth soldered joints, rough edges, and file marks, may be designated as lapper. When holding jewelry against wire brush wheel to remove stains, oxide coatings, solder flux, and to produce satin finished surfaces may be designated as scratch brusher.

Effectiveness of Norms:

Only 75% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-424 norms, 83% would have been good workers. 25% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-424 norms, only 17% would have been poor workers.

Applicability of S-424 Norms:

The aptitude test battery is applicable to jobs which include a majority of the duties described above.

GPO 864-982

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